

some grounds more accurate information, because a cloud produced under peculiar circumstances, such as a mountain-cloud cap, for example, may appear stationary under even a strong current of wind.

As an instance of another welcome result that attends cloud photography, we might refer to the confirmation it affords of recent mathematical investigation concerning the origin of cloud. Herr von Helmholtz has demonstrated that when one current of air passes over another of different density or different temperature, waves must arise at the two surfaces in contact, similar to those produced on water under the action of wind. These atmospheric waves are, however, of quite different dimensions to the ordinary water-wave. The distance between two contiguous crests in the atmosphere is incomparably larger than the similar wave-length in water, and, indeed, may be reckoned in kilometres. Air waves become visible when sufficient moisture is present, and the wave-crests can be seen in the form of clouds presenting the appearance of parallel billows, and for which the name of "Wogen wolken" has been suggested. In this form they have been repeatedly photographed. A well-known example that has been frequently reproduced, has been taken from the Lick Observatory. From other elevated stations, where the conditions have been favourable, pictures of these nebulous waves have been secured, proving the justness of the views held by Helmholtz. A mass of alto-stratus cloud will frequently show that a subsequent stage of the process of formation has been reached. When the regular parallel billows produced between strata of air have met other currents having different velocities and densities, the result is to break up the regular form into more or less lozenge-shaped pieces, of which the appearance is very familiar, and the methods and terms of description equally numerous. To do away with these vague terms of description, and to substitute others which may have closer reference to the physical structure, and perhaps indicate something of the relative heights of clouds, is one result for which we may look from the more satisfactory application of photography to cloud phenomena.

NOTES.

AT last Thursday's meeting of the Royal Society, the following words of congratulation were addressed to Lord Lister, the President, by Sir John Evans:—"As Treasurer and as one of the older of the Fellows of this Society, I beg to offer you on their behalf and my own our most hearty congratulations on the high yet well-merited honour that Her Majesty has been graciously pleased to confer upon you by elevating you to the Peerage. We have great satisfaction in feeling that, while this distinction is a fitting recognition of the value of your life-long labours in invoking the aid of science to the relief of suffering humanity, it comes at a time when this Society has the honour and pleasure of looking up to you as its President. If anything could add to that satisfaction, it is the fact that with your new dignity you are still able to retain the name of Lister, for the name of Lister, among the inhabitants of all the civilised countries of the globe, is 'familiar in their mouths as household words.'"

WE understand that Lady Prestwich is collecting material for a biography of the late Sir Joseph Prestwich, and will be grateful to friends if they will forward to her any letters they possess, addressing to Shoreham, near Sevenoaks. These will be at once copied and carefully returned.

A GERMAN antarctic meteorological station will be established shortly in Victoria Land, under the direction of Dr. Rudolph Mewes. The station will be in connection with the German South Polar expedition, and will have for its object the determination of meteorological conditions during the antarctic winter.

DR. NANSEN will lecture upon his Arctic expedition, at the Royal Albert Hall, on Monday next, at 9 p.m. A Reuter dispatch from Christiania says that during his visit to Great Britain Dr. Nansen will deliver forty-seven lectures. The explorer will then go to Germany, and at the end of March will be present at a great demonstration of the Geographical Society in Berlin, organised in his honour. On leaving Berlin Dr. Nansen will go to St. Petersburg, where he will have an official reception. Subsequently he will visit Paris in response to an intimation conveyed to him by the French Consul-General in Christiania, and will again be the object of an official reception. Early in October next, accompanied by his wife, Dr. Nansen will leave for New York, in order to deliver a course of fifty lectures in various cities of the United States.

It may be remembered that a sum of money was raised, and placed in the hands of the Royal Society, to found a scholarship in honour of Joule. The Council of the Society resolved that the scholarship should be awarded alternately in England and in other countries, for the purpose of encouraging young investigators to walk in the steps of Joule. In accordance with this decision, the Royal Society asked the Paris Academy of Sciences to nominate a candidate for the award this year; and we learn from *La Nature*, that the Committee appointed to consider the claims of young French physicists have selected M. Jean Perrin, of the École normale, for that distinction.

DR. CLEGHORN, Sanitary Commissioner for Bombay, is the special Indian medical expert selected by the Indian Government to attend the International Conference, to be held in Venice on February 10, to consider what means Europe should take to control the bubonic plague, should that disease advance towards the confines of Europe. Dr. Thorne Thorne, principal medical officer of health to the Local Government Board, has accepted the appointment of British Technical Commissioner at the same Conference.

THE honour in which Pasteur's name is held throughout the world is shown by the fact, announced in the *British Medical Journal*, that the subscriptions in France and other countries for a statue to the great investigator now amounts to more than £10,000. M. Paul Dubois has been selected as the sculptor, and the site for the statue will probably be the space between the Rue de Médecins and the Luxembourg Gardens. More than £20,000 has already been spent in the erection of statues of Pasteur in various parts of France. As an instance of the high regard in which he is held outside that country, it may be mentioned that the municipality of Mexico has given the name of Pasteur to the gardens situated in front of the National School of Medicine in that city.

WHEN the regulations for the muzzling of dogs in London and adjoining counties came into force at the beginning of last year, it was pointed out in these columns that rabies could not be stamped out by leaving local authorities to deal with it. The welfare of adjacent districts is so closely involved, that to place in the hands of different County Councils the power to enforce regulations for preventing the spread of disease, which knows not county boundaries, is absurd on the face of it. The only way to effectually cope with the evil is for some central authority, as, for instance, the Board of Agriculture, to compel joint action on the part of authorities having control over the areas where rabies exist. A muzzling and registration order so enforced for a couple of years would, in all probability, bring about the disappearance of the disease from our island. The report, just issued, of the Departmental Committee of the Board of Agriculture, appointed at the end of last April, "to inquire also and report upon the working of the laws relating to dogs," bears out this opinion. Statistics are quoted to support the con-

clusion that the powers of muzzling as exercised since 1882 by local authorities are inadequate to eradicate rabies, and only result in temporary and local checks to its spread. It is pointed out that the Board of Agriculture should have regard to the country as a whole, and should impose muzzling over considerable areas, irrespective of the boundaries of boroughs and counties; that the Board should impose it, in fact, where it is really required, and leave the rest of the country free. With the extirpation of rabies the necessity of muzzling will have disappeared, but the Committee think it expedient that more efficient means should be devised for the due licensing of dogs, and for their subsequent regulation. As to the question of a compulsory system of registration of dogs, it is considered that the matter should be entrusted to the Board of Agriculture, not to local authorities. With regard to the importation of dogs, the Committee consider that, without resorting to the extreme remedy of absolute prohibition, it would be possible for the Board of Agriculture to arrange, in concert with the Customs authorities, a system under which a sufficiently effective supervision may be secured over dogs landed in this country. In Norway, Denmark, and Sweden a system of quarantine is insisted upon; and in New South Wales, we believe, a dog has to undergo about six months' quarantine before it is allowed to enter the country, a heavy fine being imposed on the person causing this quarantine to be averted. If something of this kind were enforced in our own country, rabies would be as little known here as it is there. The first thing to be done, is to stamp out the disease by combined action; it would then be a comparatively easy matter to prevent its re-introduction.

AN eminent surgeon, who rendered distinguished services to the medical profession and to humanity, has just passed away in the person of Sir Spencer Wells. In 1882-83 Sir Spencer Wells was President of the Royal College of Surgeons. He received the honorary degree of M.D. from several universities, and was a member of many learned societies at home and abroad.

DR. AGAMENNONE, who has studied so successfully the earthquakes of Turkey and the south-east of Europe during the last two years, has not renewed his engagement with the Ottoman Government, and will shortly resume his work in Italy in connection with the Central Office of Meteorology and Geodynamics at Rome.

THE President of the Board of Trade has appointed a Committee, consisting of Major F. A. Marindin, R.E., C.M.G. (chairman), Earl Russell, Sir Douglas Galton, K.C.B., F.R.S., Sir Charles Scotter, and Dr. John Scott Haldane, to inquire into the existing system of ventilation of tunnels on the Metropolitan Railway, and report whether any, and, if so, what steps can be taken to add to its efficiency in the interest of the public.

ON Friday, January 22, Prof. Guido Cora delivered an address, at the Alpine Club in Turin, on Dr. Nansen's Polar expedition of 1893-96. This was, we understand, the first special meeting of a scientific society held to discuss the results obtained by Nansen in his recent journey.

PROF. W. E. AYRTON, F.R.S., will lecture at the Imperial Institute, next Monday, on "Sixty Years of Submarine Telegraphy." The lecture will be illustrated with historical and modern apparatus showing the development of submarine telegraphy, oil paintings of the chief pioneers, lantern slides showing the operations of making and laying a cable, experiments on the velocity of electric waves in a submarine cable, and in other ways will be made interesting. Mr. W. H. Preece, C.B., F.R.S., will occupy the chair.

ON Thursday next (February 11), Dr. J. W. Gregory will deliver the first of a course of three lectures at the Royal Institution, on "The Problems of Arctic Geology"; and on Saturday

(February 13) Mr. Walter Frewen Lord will begin a course of three lectures on "The Growth of the Mediterranean Route to the East." The Friday evening discourse (on February 12) will be delivered by Prof. John Milne, F.R.S., his subject being "Recent Advances in Seismology." That on February 19 will be by Mr. G. Johnstone Stoney, who will lecture on "The Approaching Return of the Great Swarm of November Meteors."

THE twenty-fourth annual dinner of the old students of the Royal School of Mines was held on Tuesday, January 26, at the Criterion Restaurant, and was attended by over 120 Associates and others who have been connected with the School. The chair was taken by Dr. T. K. Rose, of the Royal Mint, and he was supported by a number of past and present Professors at the School of Mines and Royal College of Science. In proposing the toast of prosperity to the mining and metallurgical industries, Dr. Rose dealt with the great advances in gold production and the influence of the cyanide process, and then referred to the recent progress of investigation of the inner nature of metals. The recently published register of old students was also mentioned as an event of the year.

DR. ARTHUR WILLEY, who worked out the later development of *Amphioxus* when he was a pupil of Prof. Ray Lankester at University College, London, has just made a most important discovery. He has succeeded in obtaining the ripe eggs of the Pearly Nautilus, and is now at work on the development of that most interesting animal. Two and a half years ago Dr. Willey gave up a teaching post in Columbia College, New York, and accepted the Balfour Studentship of the University of Cambridge, in order to proceed to the coast of New Guinea and neighbouring islands in quest of the embryological history of the pearly nautilus. He has had great numbers of live nautilus, but, in spite of all efforts, had, till December 5 last, failed to obtain the eggs. Specimens which he was keeping in a large cage, sunk in the sea at a suitable spot in the Loyalty Islands, were found by him on that day to have spawned. Dr. Willey's indomitable perseverance and devotion to his task have thus been at last crowned by success. Dr. Willey has been assisted in his arduous and dangerous enterprise—amongst the savage people of those remote islands—by grants of money from the Government Grant Fund administered by the Royal Society.

THE first number of vol. vi. of the *Atti dei Lincei* contains no less than three papers on phenomena associated with Röntgen rays. In the first of these, Prof. Villari considers the relation between the dissociation produced in gases by these rays, in virtue of which such gases discharge electrified bodies, and the molecular association produced by the transformation of oxygen into ozone by means of the electric spark. In one series of experiments a current of air was first traversed by Röntgen rays and then allowed to pass through an ozonator before falling on a charged electroscope, and it was found that the ozonator deprived the air of its power of discharging the electroscope. Prof. Villari's paper is illustrated by figures showing the patterns obtained when the surface of the ozonator is sprinkled with a mixture of sulphur and red lead.

THE second paper is a note, by Prof. A. Róiti, on the apparent deflection of Röntgen rays behind opaque obstacles. Prof. Róiti has obtained closely analogous effects with ordinary light by observing the shadows of opaque objects made by an incandescent gas-burner. A note, by Prof. Stefano Capranica, forms a sequel to his previous investigations on the biological action of the rays. Moles were inoculated with the virus of enteritis, and were subjected to the action of the rays. The symptoms were identical with those shown by animals protected from the rays, and the moles died in either case in about the same time; showing that the rays possess no influence, either for good or bad, on animals infested by pathogenic bacilli.

A. DE HEMPTINNE publishes, in the December number of the *Zeitschrift für physikalische Chemie*, an account of an attempt to detect some action of the Röntgen rays on chemical processes. His results confirm those already obtained by Prof. Dixon and Mr. H. B. Baker, and others. The conductivity of electrolytes in aqueous solution, the hydrolysis of ethereal salts by acids, and the combination of chlorine with hydrogen and carbon monoxide were studied; no effect could be detected. Solutions of silver nitrate in alcohol, and of mercuric chloride and ammonium oxalate in water, which are decomposed by light, gave only minute and uncertain traces of change when exposed to the Röntgen rays.

A WRITER in the current number of *Blackwood's Magazine* gives a prospective account of a trans-Pacific cable. It is interesting to find that the coral reefs, which, in the opinion of the late Sir John Pender, constituted the chief difficulty in the way of the scheme, are not a serious obstacle. Modern soundings have shown the reefs to lie in well-defined groups, and it happens that the ocean expanses between them contain wide and uniform depressions, particularly suitable for a cable. The article points out that the most favoured route is from Vancouver to Fanning Island; Fanning Island to Fiji; Fiji to Norfolk Island; and from Norfolk Island in two sections—one to New Zealand, and the other to Australia. Fanning Island is of coral formation, and is about ten miles long by four miles wide; it is the nearest British possession to Vancouver on the Australian route. The article gives an account of the history of the Pacific cable scheme, and states its financial aspect.

THE current number of the *Comptes rendus* contains a description of an absolute electrometer intended for measuring small electromotive forces (about 1 volt), designed by MM. Pérot et Fabry. The instrument consists of an attracted disc electrometer, in which the necessary sensitiveness is obtained by greatly reducing the distance between the plates. The attracting disc consists of the plane end of a glass cylinder about 6 cm. in diameter and 1 cm. high, this height being large compared with the distance between the two discs. The attracted disc consists of a thin circular disc of glass about 7 cm. in diameter, and which is virtually an infinite plane. These discs are lightly silvered, and their parallelism adjusted, and their distance measured by being traversed normally by a beam of monochromatic light, which forms interference bands between the light which has passed directly through the thin silver coating and that which has been reflected an even number of times at the silvered surfaces. The electrical attraction is measured by comparing the deformation produced in three springs, which carry the movable disc by the electrical forces, with that produced by a known weight when placed on the movable disc. The authors have obtained 0.0048467 as the mean value of the electromotive force of a Clark cell at 0° in electrostatic measure, and, taking the electromotive force in electromagnetic units as 1.4535×10^9 , the value of v , the ratio of the units obtained is

$$v = 2.9989 \times 10^{10}.$$

The authors think that in this determination, which they regard as simply a preliminary one, the mean error between the different measurements is 1 in 1000.

A PAPER upon the subject of vertical earth-air electric currents was presented to the Philosophical Society of Washington by Dr. L. A. Bauer on January 9. Vertical earth-air electric currents were first revealed by Dr. Adolf Schmidt, of Gotha. In his mathematical analysis of the earth's magnetic field—the most carefully executed analysis up to date—he reached the following conclusion: The earth's total magnetic force consists of three parts, viz. (1) the greatest part; this is to be referred to causes *within* the earth's crust, and possesses

a potential. (2) The smallest part, about 1/40 of the entire force; this is due to causes *outside* of the earth's crust, and likewise possesses a potential. (3) A somewhat larger part than the preceding; this does not possess a potential, and, in consequence, points to the existence of vertical electric currents. These currents amount, on the average, for the earth's entire surface to one-sixth of an ampere per square kilometre. The existence of such currents is indicated by the non-vanishing of the line integral of the earth's horizontal magnetic force resolved along a closed curve of the earth's surface. Gauss carried out this test in a special case, and finding the integral practically zero, he assumed that the entire force is due to a potential. More recently Prof. Rücker applied the same test. He found "no evidence in favour of the existence of vertical currents" over a region of the earth—the British Isles—which had been very minutely surveyed. The results of some preliminary investigations being confirmatory of Schmidt's conclusion, Dr. Bauer determined to carry out the test in a thoroughly systematic manner, viz. to take as the closed curves parallels of latitude. The results obtained confirm those of Dr. Schmidt's more elaborate investigation. Summing-up, Dr. Bauer finds that:—"There are vertical electric currents which pass from the air into the earth, and back again into the air. Between 60° N. and 60° S. the average current intensity per square kilometre is about one-tenth of an ampere."

AT Governor's Island, a few days ago, Lieut. Hugh D. Wise, of the United States Army, made a very successful ascent by kites. He used four kites, a modification of the Hargrave invention, and weighing about 16 pounds each. The kites were attached to a windlass running out a ½-inch manilla cord connected with an iron ring drawn up fifty feet above the ground. From the ring the kites ran up on two 1-inch cords. Two kites, one above the other, were attached to each of the latter cords. To the ring was also attached a tackle and block, running a heavy rope to the ground. On this rope Lieut. Wise was drawn up, and remained for a considerable time at a height of about 42 feet, surveying the environment on all sides with his field-glass. The wind was blowing fifteen miles an hour, and the pull of the kites was about 400 pounds.

A SHORT but interesting account of the earthquake of last December 17, founded partly on newspaper descriptions and partly on the notes of observers, is given in Symons's *Meteorological Magazine* for January. The first of the two maps, which illustrate the paper, shows many of the places where the shock was felt and where structural damage occurred. The writer remarks that the area affected was apparently 350 miles in diameter, and contained about 100,000 square miles; and that the part within which damage was produced, which is nearly central with regard to the former, is about 130 miles from north to south, and of a maximum breadth of 40 miles, thus containing nearly 4000 square miles, or about ten times the corresponding area of the Essex earthquake of 1884. He believes that there is evidence that the shock was one of a series which can be traced back for more than six centuries, and gives small sketch-maps showing the approximate boundaries of the shocks of the years 1248, 1574, 1705, 1863, 1868, and 1896. Taking the initial time of the recent disturbance as 5.32 a.m., and Hereford as the centre, the more careful time records appear to show that the velocity of the earth-wave may have been about 30 miles a minute. The paper concludes with a list of the minor shocks, a series of records of the luminous phenomena, which, it is suggested, prove only that a local thunderstorm occurred at about the same time as the shock, and some references to the sound which accompanied the earthquake.

DURING the last few years, one of the principal sources of income of cold-storage companies in the United States has been

derived from the storage of furs, rugs, and valuable woollen goods during the summer months to prevent damage by the larvæ of clothes moths, clothes beetles, and allied insects. This development raised the question as to the exact or approximate temperature at which furs and similar goods should be kept in order to maintain in a state of inactivity any destructive insects which they might contain. The matter was referred to Dr. L. O. Howard, entomologist to the U.S. Department of Agriculture, but he was unable to furnish the necessary information, or to find any facts bearing upon the subject. A series of experiments were, therefore, begun, and the results are described in the *Proceedings of the Eighth Annual Meeting of the Association of Economic Entomologists*, received a few days ago. The insects subjected to experiment were the common clothes moth, the black carpet beetle, the leather beetle, the dark meal-worm, and a cabinet beetle. The results seem to show definitely that it is perfectly safe to keep materials infested by any of the insects mentioned at a temperature of 40° to 42° F. during the summer months, and that the cold-storage companies, which have been keeping the goods at temperatures of 12° to 20°, have been wasting energy in producing a temperature about 20° lower than is required. A number of valuable papers on economic entomology will be found in the *Bulletin* (No. 6 of the U.S. Department of Agriculture) in which Mr. Howard's paper appears.

EMBRYOLOGICAL research is now flourishing in the University of Tōkyō, Japan. Part I, vol. x. of the *Journal of the College of Science* in that University, consists of an elaborate memoir, by Prof. K. Mitsukuri, on the "Fate of the Blastopore, the Relations of the Primitive Streak, &c., in Chelonia." The text is in English, and there are eleven plates containing numerous figures, both of surface views of embryos and of sections. The memoir is appropriately dedicated to the memory of the late F. M. Balfour, of whom the author is one of the distinguished pupils. The embryos studied were those of three species of turtle common in Japan, those of two of them having been obtained in abundance with great facility at a turtle farm. The observations throw a great deal of light on the nature of the primitive streak, and on the formation of the posterior end of the embryo, and the general result is to confirm and elaborate in detail the interpretation of reptilian development in its early stages, which is explained in Balfour's "Comparative Embryology." New suggestions, however, are made concerning the relations between the mode of development and the evolution of yolk in the various classes of vertebrates.

THE development of the renal and generative organs in dog-fishes is one of the most important subjects in vertebrate morphology, and has occupied much of the attention of several eminent investigators. Prof. Carl Rabl has studied the matter in great detail during the past few years, and in the current number of the *Morphologisches Jahrbuch*, edited by Gegenbaur, gives a new description of the history of these organs in the embryo, and reconsiders various questions concerning their evolution.

THE horary values of the magnetic elements at Copenhagen, during the years 1893-94, are given in the "Annales de l'Observatoire magnétique de Copenhague," prepared by Dr. Adam Paulsen, Director of the Denmark Meteorological Institute, and just published.

MESSRS. LONGMANS, GREEN, AND CO. have published, as a pamphlet of twenty-four pages, the first part of "Exercises in Practical Physiology," dealing with elementary physiological chemistry. Prof. A. D. Waller, F.R.S., and Mr. W. Legge Symes are the authors; and the exercises they give should be of great assistance in laboratories of physiological chemistry.

A COURSE of six short lectures and demonstrations on fish and fisheries, free to the public, is now going on at University College, Liverpool. Prof. Herdman opened the course with an account of the present position of our fishing industries, and the advantages to be gained from biological investigations. Mr. R. A. Dawson followed with a lecture on the need and object of Sea Fishery Committees, and on the different methods of fishing in the Lancashire Sea Fisheries District. Some methods of fishing, and of fish culture in other European countries, were described by Mr. R. L. Ascroft on Monday evening. The three ensuing Monday evenings in this month will be devoted to fish parasites, and some constituents of the food of fishes, by Mr. Isaac C. Thompson; the habits and life-history of crabs and lobsters, by Mr. Andrew Scott; and the bacteriology of fish, and the connection of fish with disease, by Prof. Boyce. The Lancashire Sea Fisheries Committee is fortunate in being able to arrange a course of lectures so very serviceable to all who are interested in the fishing industry of the district.

SOMEWHAT remarkable results have been obtained by Messrs. T. Paul and B. Krönig in an investigation into the behaviour of bacteria towards chemical reagents, which appears in the December number of the *Zeitschrift für physikalische Chemie*. A definite number of organisms are exposed to the action of a solution of the disinfectant for a definite time; after complete removal of the disinfectant, the number of organisms still capable of development is determined. The spores of the anthrax bacillus were used in the greater part of the experiments. It is found that the different salts of a metal possessing a specific poisonous character—mercury, for example—are not by any means equally deadly. Under otherwise similar circumstances, those salts which are electrolytically dissociated to the greatest extent are most active. For example, a solution of mercuric chloride contains very many more mercury ions than one of mercuric cyanide of the same concentration, and the latter salt is very much less deadly than the former. The addition of sodium chloride to a solution of mercuric chloride diminishes its disinfecting power to a very marked extent; in this case, also, the number of mercury ions is diminished by the presence of the salt. This is of practical importance, because the addition of salt to mercuric chloride solutions is often recommended in order to increase its solubility. Similar results are obtained with silver salts; such salts as the nitrate, chlorate, and benzene sulphonate, which are dissociated into their ions to a considerable and approximately equal extent in aqueous solution, have nearly the same disinfecting action, while the addition of sodium thiosulphate or of potassium cyanide, with which the silver ions combine to form complex ions, practically destroys the disinfecting action altogether. The disinfecting power of solutions of bases or of acids depends, on the whole, on the strength of the base or acid—that is, on its degree of electrolytic dissociation. Although in all these cases the influence of the dissociation is plainly apparent, the specific action of the anion and of the undissociated molecule is by no means to be neglected. Hydrofluoric acid, for example, though a comparatively weak acid, has a more powerful action than acids like nitric or hydrochloric. Of practical interest is the fact that silver nitrate has a maximum disinfecting power when dissolved in 50 per cent. alcohol, while with mercuric chloride the maximum occurs at 25 per cent. Solutions of these salts in absolute alcohol are practically without effect on anthrax spores.

THE additions to the Zoological Society's Gardens during the past week include a Bonnet Monkey (*Macacus sinicus*, ♀) from India, presented by Miss E. Blanche Joyce; a White-backed Piping-Crow (*Gymnorhina leucanota*) from Australia, presented by Mr. H. Brame; a Kinkajou (*Cercoleptes caudivolvulus*) from South America, deposited; a Black Lemur (*Lemur macaco*, ♀) from Madagascar, purchased.